

NAME DATE.....

INDEX NO. SIGNATURE

233/3

CHEMISTRY

PRACTICAL

PAPER 3

TIME: 2½ HOURS.

MARKING
SCHEME

LANET JOINT EVALUATION (LANJET 2024)

FORM 4

Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

- o Write your name and index number in the spaces provided above.
- o Answer **ALL** the questions in the spaces provided.
- o You are not allowed to start working with the apparatus for the first 15 minutes of the 2½ hours allowed time for the paper.
- o Use the 15 minutes to read through the question paper and note the chemicals you require
- o Mathematical tables and electronic calculators may be used.
- o All working **MUST** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1	17	
2	17	
3	6	
Total score	40	

This paper consists of 6 printed pages.

Candidates should check to ensure that all pages are printed as indicated and no questions are missing

- 4.0g of dibasic alkanic acid labelled solid A
- Solution B which is made by dissolving 8g sodium hydroxide in water to make 1 litre of solution.

You are required to determine:

- Solubility of solid A at different temperatures
- Molar mass of the alkanoic acid

Procedure 1

- Using a burette add 5cm³ of distilled water to solid in a boiling tube. Heat the mixture while stirring using a thermometer to 72°C. When the solid had dissolved allow the solution to cool while stirring with a thermometer. Use water bath to accelerate the cooling. Note the temperature at which the first crystals appear and record in the table below.
- Using a burette, add 5cm³ of distilled water into mixture in step (a), warm the mixture until all the solid dissolves. Allow the mixture to cool while stirring and note the temperature at which crystals appears.
- Repeat procedure (b) three more times and record the temperature in table 1 below. **Retain the content of boiling tube to be used in procedure II.**
- Complete table 1 below by calculating solubility of solid A at different temperatures.

Table I

Volume of water in boiling tube (cm ³)	Temperature at which crystals appear (°C)	Solubility of solid A is 100g of water
5	56	80.0
10	52	40.0
15	36	26.7
20	30	20.0
25	22	16.0

(6mks)

Complete table CT ✓ STH top is 5A Solubility.

(3mks)

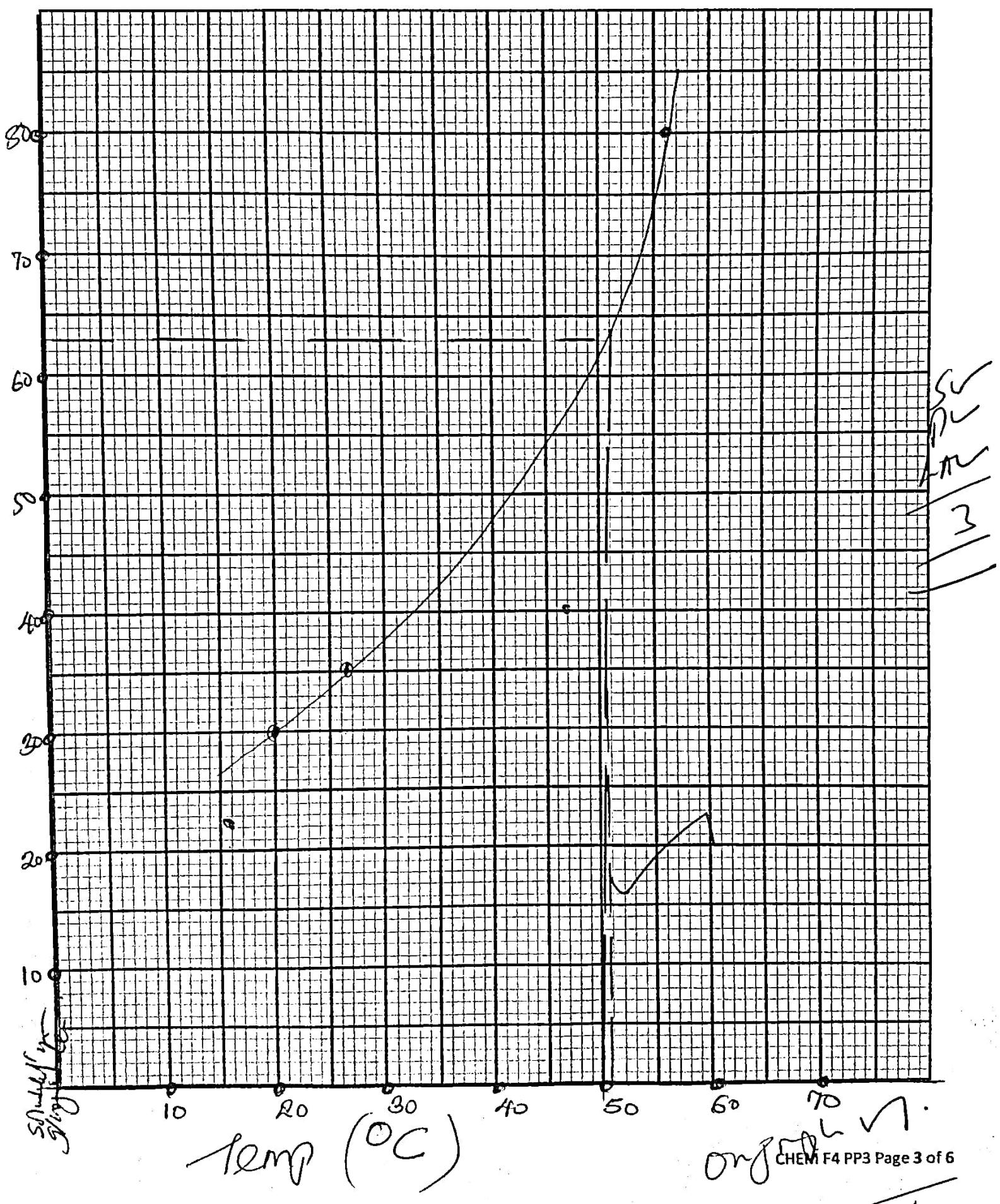
On the grid provided plot the graph of solubility of solid A (vertical axis) against temperature in °C.

Decimil Trends D ✓

T ✓ = gradual decrease w/ temp
at which crystals appear.

$$\checkmark = 1 \text{ mol/L}$$

$$\checkmark = 1/2 \text{ mol/L}$$



- ii) Using the graph, determine the temperature at which 63g of solid A would dissolve in 100cm³ of water.

51°C

(1mk)

- iii) What is the relationship between temperature increase and solubility of solid A

(1mk)

As temperature increases, solubility increases ✓

Procedure II

- e) Transfer the content of boiling tube from procedure I into 250ml volumetric flask, rinse both the boiling tube and thermometer with distilled water then add content into volumetric flask. Add more distilled water to the mark, shake the mixture and label this as solution A.
- f) Fill the burette with solution A then using a clean pipette add 25cm³ of solution B into conical flask, then 3 drops of phenolphthalein indicator. Titrate A against B until the end point record results in table below.
Repeat procedure (f) twice to complete table II below.

Table I

	I	II	III	N/B Values averaged $\pm 0.2\text{ cm}^3$
Find burette readings	19.8	39.5	29.8	C✓
Initial burette readings	0.0	19.8	10.0	D✓
Volume of solution A in (cm ³)	19.8	19.7	19.8	P✓ A $\pm 0.1\text{ cm}^3$ $\pm 0.2\text{ cm}^3$ F✓

- i) Calculate the average volume of solution A

$$V_A = \frac{19.8 + 19.7 + 19.8}{3} = 19.8\text{ cm}^3$$

(5mks)

- ii) Calculate the molarity of solution B in Moles per litre.

(Na = 23 H = 1 O = 16)

$$\text{Moles ratio} : \text{Moles/L} = 51\text{ cm}^3 / 25\text{ cm}^3 = \frac{85}{(23+16+1)} = 0.2\text{ M}$$

(1mk)

- iii) Calculate the number of moles of solution B used

$$\frac{0.2 \times 25}{1000} = 0.005\text{ moles}$$

(1mk)

- iv) Given that solid A is a dibasic acid with formula H₂X, determine the number of moles of solution A in litre value.

$$\text{Moles ratio } 1:2 \therefore 0.005/2 = 0.0025\text{ moles}$$

(1mk)

- v) How many moles of solution A are there in 250cm³ of solution A.

$$0.0025\text{ moles} \geq 19.8\text{ cm}^3$$

(1mk)

$$? \leq 250\text{ cm}^3$$

$$\frac{0.0025 \times 250}{19.8} = 0.03157\text{ moles}$$

✓

- vi) Calculate the relative formula mass of solid A.

(1mk)

$$\text{Moles} = \text{mass}/\text{RFM} \therefore \text{RFM} = \frac{45}{0.3157} = 126.7$$

Q2. You are provided with substance C. Carry out the following tests and record your observations and inferences in spaces provided.

- a) Describe the appearance of solid C.

White crystalline solid ✓
N/B Colourless ✓
state ✓ (1mk)

- b) Place 1/3 of solid C in a boiling tube, heat it gently then strongly.

Observations	Inferences
- Cracking sound/disperse sound.	- NO_3^- present ✓
- White solid changed to brown, yellow on Cooling. →	- Pb^{2+} ✓
- Brown gas produced. (1mk)	(1mk)

each observation 1/2 mk -

- c) Place the remaining amount of substance C in a boiling tube. Add about 10cm of distilled water and shake the mixture for test (d) below.

Observations	Inferences
White solid dissolved forming colourless solution. ✓ (1mk)	- Soluble Salt/Compound ✓. - Absence of Cu^{2+} , Fe^{2+} , Fe^{3+} ✓ (1mk)

- d) Divide the solution obtained in step (c) above into 4 portions.

- i) To first portion add 3 drops of lead (II) Nitrate provided in access.

Observations	Inferences
No white precipitate (1mk)	SO_4^{2-} SO_3^{2-} CO_3^{2-} Cl^- } Absent ✓ All = ✓ 3 = ✓ 1 or 2 = 0 .

- ii) To the second portion, add drops of Barium Nitrate provided

Observations	Inferences
No White Precipitate ✓ (1mk)	SO_4^{2-} SO_3^{2-} CO_3^{2-} } Absent ✓ All = ✓ 2 = ✓ 1 = 0 .

iii) To third portion add drops of 2M NaOH until in excess.

Observations

White precipitate ✓
Soluble in excess ✓
(1mk)

Inferences

Pb²⁺
Al³⁺
Zn²⁺ } Present
(1mk) ✓
All = ✓
2 = ✓
1 = 0.

iv) To the last portion, add drops of KI provided in excess.

Observations

Yellow precipitate ✓
(1mk)

Inferences

Pb²⁺ Confirmed ✓
(1mk)

Q3. You are provided with liquid D. Carry out tests below, record your observations and inferences in the spaces provided.

a) Place 1/3 of liquid d on watch glass and ignite it using a burning splint.

Observations

Burn with blue non-sooty flame ✓
(1mk)

Inferences

C=C or -C≡C- Absent ✓
(1mk)
Ignore -C-C-

b) To about 1cm of liquid D in a test tube, add about 3cm³ of distilled water and shake.

Observations

Liquids are miscible or forms homogeneous mixture
(1mk)

Inferences

D is polar ✓
(1mk)

c) To remaining portion of liquid D add 3 drops of acidified potassium chromate vi warm the mixture and allow it to stand for about 1 minute.

Observations

Orange, acidic Potassium Chromate vi changes to green. ✓
(1mk)

Inferences

ROH Present ✓
(1mk)